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Notes:

1. Untranslatable words are replaced with asterisks (***).
2. Texts in the figures are not translated and shown as is.

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Dictionary: Last updated 04/14/2009 / Priority: 1. Information communication technology (ICT) / 2. Electronic engineering / 3. Technical term

FULL CONTENTS

[Claim(s)]

[Claim 1]Optical variable marking comprising containing a translucent substrate:

The 1st surface covered by an optical variable layer.

The 2nd surface partially covered in a layer covered with a predetermined metal layer or metal of pattern shape.

[Claim 2]The optical variable marking according to claim 1 which is a plastic film in which said translucent substrate contains optical absorption nature particles.

[Claim 3]Said optical absorption nature particle is the optical variable marking of carbon black and absorbency paints according to claim 2 which contains either at least.

[Claim 4]The optical variable marking according to any one of claims 1 to 3 in which said translucent substrate is a circular light film.

[Claim 5]The optical variable marking according to any one of claims 1 to 4 containing a cholesteric-liquid-crystal substance in which said optical variable layer has plane surface orientation, and which polymerized.

[Claim 6]The optical variable marking according to any one of claims 1 to 5 containing one or more sorts of optical variable paints currently distributed by binding material with said transparent optical variable layer.

[Claim 7]The optical variable marking according to claim 6 in which said optical variable paints contain one or more sorts chosen from a group which consists of coherence paints, a pearlescent pigment, and liquid crystal paints.

[Claim 8]A manufacturing method of the optical variable marking according to any one of claims 1 to 5 characterized by comprising the following.

A process at which the 2nd surface coats the 1st surface of a translucent substrate covered with metal with a layer of a cholesteric-liquid-crystal substance which can polymerize.

A process of polymerizing this substance that made plane surface orientation arranging said cholesteric-liquid-crystal substance, and was arranged in this cholesteric phase.

A process of removing a field where a metal layer was chosen from the 2nd substrate face by laser, and forming a pattern.

[Claim 9]A manufacturing method of the optical variable marking according to claim 1, 2, 3, 4, 6, or 7 characterized by comprising the following.

A process at which the 2nd surface coats the 1st surface of a translucent substrate covered with metal with a layer of optical variable paints distributed by transparent binding material.

A process of removing a field where a metal layer was chosen from the 2nd substrate face by laser, and forming a pattern.

[Claim 10]A manufacturing method of the optical variable marking according to claim 9 which stiffens said transparent binding material in advance of a process of forming said pattern.

[Claim 11]Accessories including the optical variable marking according to any one of claims 1 to 7.

[Claim 12]A security article including the optical variable marking according to any one of claims 1 to 7.

[Claim 13]A decoration method which uses the optical variable marking according to any one of claims 1 to 7.

[Claim 14]A security method which uses the optical variable marking according to any one of claims 1 to 7.

[Claim 15]Security marking used including the optical variable marking according to any one of claims 1 to 7 for data or forgery prevention of information, attestation, a check, or discernment.

[Claim 16]A thread used including the optical variable marking according to any one of claims 1 to 7 for data or forgery prevention of information, attestation, a check, or discernment.

[Claim 17]A device used including the optical variable marking according to any one of claims 1 to 7 for data or forgery prevention of information, attestation, a check, or discernment.

[Claim 18]A hologram used including the optical variable marking according to any one of claims 1 to 7 for data or forgery prevention of information, attestation, a check, or discernment.

[Claim 19]Hot stamp foil used including the optical variable marking according to any one of claims 1 to 7 for data or forgery prevention of information, attestation, a check, or discernment.

[Claim 20]A watermark used including the optical variable marking according to any one of claims 1 to 7 for data or forgery prevention of information, attestation, a check, or discernment.

[Claim 21]A data recording medium containing one or more chosen from a group which consists of the security marking according to claim 15, the thread according to claim 16, the device according to claim 17, the hologram according to claim 18, hot stamp foil given in Claim 19, and the watermark according to claim 20.

[Claim 22]A precious document containing one or more chosen from a group which consists of the security marking according to claim 15, the thread according to claim 16, the device according to claim 17, the hologram according to claim 18, hot stamp foil given in Claim 19, and the watermark according to claim 20.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the use to the method of preparing optical variable marking which contains the optical variable layer which is a liquid crystal polymer layer or is a layer containing a pearlescent pigment, for example, and such optical variable marking and an ornament, or application to security.

[0002]

[Description of the Prior Art]Using a liquid crystal polymer film as a security device is reported in advanced technology. European patent EP0435029 has disclosed the data storage medium which has the optical good transformation security elements containing the liquid crystal polymer which carried out orientation. U.S. Pat. No. 5,678,863 (it corresponds to British patent GB2,268,906) has disclosed security marking to a precious document including the watermark coated with the cholesteric-liquid-crystal substance which produces an optical effect which is different when it sees by the transmitted light and a reflected light. This cholesteric-liquid-crystal substance is a liquid crystal polymer, for example.

[0003]However, the device indicated to advanced technology has some faults. Therefore, the security elements indicated to European patent EP0435029 are restricted as long as only the color in which the liquid crystal polymer was reflected can be seen with the last element. This is because the liquid crystal layer is produced as a part of laminated structure body which has the plain black background. Several steps, such as manufacture of a liquid crystal polymer film, movement of the liquid crystal polymer film from one substrate to another substrate, and formation of a subsequent laminated structure body, are needed for manufacture of the security elements of a device.

[0004]Security marking indicated to U.S. Pat. No. 5,678,863 is accompanied by pretreating a precious document, in order to space (namely, field where optical density differs). The field of

the watermark is strengthened by applied liquid crystal coating differing and being visible by a reflection and penetration, and the fields where optical density differs differing further, and being visible.

[0005]

[Problem to be solved by the invention]The purpose of this invention is to provide especially optical variable marking which not having a fault of the device of conventional technology and manufacturing it can apply to a wide range substrate, the surface, and a subject easily for an ornament and application to security.

[0006]

[Means for solving problem]The inventors of this invention found out that it might realize by providing optical variable marking containing the translucent substrate in which the above-mentioned purpose has the 1st surface covered by the optical variable layer, and the 2nd surface covered by the metal layer from which the part was removed with predetermined pattern shape. This optical variable layer is a layer which is a liquid crystal polymer layer or includes the pearlescent pigment distributed by the transparent binding material, for example. When marking is seen from the metallic layer side, a pattern is recognized visually as a dark region in a metal layer. an optical variable layer being able to be seen as a uniform layer which shows the reflected colors which change with the angles to see, on the other hand, when marking is seen from the translucent (transflective) layer side with perpendicular Lighting Sub-Division, [a variable layer] In a penetration, the pattern in a metal layer can be seen through an optical variable layer and a translucent board.

[0007]Optical variable marking by this invention conquers restriction of European patent EP0435029 by having both a reflected figure which may be produced, and a penetration image. I hear that the document itself does not need a pretreatment at all, but it may include marking as a part of the structure, and it has an advantage which exceeds security marking indicated to U.S. Pat. No. 5,678,863. In this invention, when a device is seen by reflection, marking which may be recognized visually is not seen at all. Thereby, the hidden feature is given to a document. Optical variable marking of this invention is easy to manufacture as shown below.

[0008]When another advantage of optical variable marking of this invention is compared with the device of advanced technology, I hear that an optical variable film can be prepared for the use in 1 time of the roll-to-roll process (roll to roll process) of including coating, lamination, hardening, and winding up, and it is. In this stage, output is a reflexivity film. The layer covered by processing of the after that of the film by exposing to laser energy by metal in the specified field can be removed. Therefore, a design can be changed, without being forced to change the quality of the material of the document itself.

[0009]The term "optical variable one" currently used with terminological definition this

application is substantially transparent when it sees by penetration, but when it sees to the substrate which does not reflect light, it means the layer, coating, the device, paints, and substance in which the reflected colors which change with the angles to see are shown. [as a typical example of the optical variable substance known in advanced technology, or optical variable paints] For example, in the liquid crystal paints of a small shaped plate prepared from the cholesteric-liquid-crystal coating thing which has plane arrangement, or such a coating thing, and a row for example, It is coated with one or more layers of a titanium dioxide, iron oxide, titanium oxide iron, chromic oxide, or such combination, for example, the interference paints or pearlescent pigment like flakes of mica, SiO_2 , aluminum $_2\text{O}_3$, TiO_2 , or glass is mentioned.

[0010]The term "film" currently used with this application includes coating or the layer which exists between two substrates on the free-standing (that is, it exists without support) film in which remarkable mechanical stability and pliability are shown somewhat, and a supporting board.

[0011]The term "marking" is the shape of a regular pattern or an image, and includes wrap marking for the field where a wrap film or a layer differs the whole field of a substrate from a substrate, for example.

[0012][a term "liquid crystal substance or meso genic (mesogenic) substance", or "a liquid crystal compound or a meso genic (mesogenic) compound"] The substance or compound containing one or more meso genic (mesogenic) machines (namely, basis which has the ability to guide the action of a liquid crystal phase) rod form, tabular, or disc-like shall be meant. The liquid crystal compound which has a cylindrical or tabular basis is known for this field as a "KARAMI tic (calamitic)" liquid crystal again. The liquid crystal compound which has a disc-like basis is known for this field as a "disco tic (discotic)" liquid crystal again. There is not necessarily necessity that the compound or substance containing a meso genic machine shows the liquid crystal phase itself. When other mixture, meso genic compound, meso genic substances, or those mixtures with a compound polymerize, the action of a liquid crystal phase can also be shown by such a compound or a substance.

[0013]In order to facilitate, the term "liquid crystal substance" is henceforth used to both a liquid crystal substance and a meso genic substance, and the term "MESOGEN (mesogen)" is used to the meso genic machine of such a substance.

[0014]Director (director) means the direction of orientation where a long molecular axis (in the case of a KARAMI tic compound) of MESOGEN in a liquid crystal substance or a short molecular axis (in the case of a disco tic compound) is preferred.

[0015]As for a term "planar structure" or a term "plane surface orientation", the direction of orientation shows a layer or a film of a parallel liquid crystal substance substantially to a field of a film or a layer.

[0016]As for a term "HOMEOTOROPIKKU (homeotropic) structure" or a term "homeotropic orientation", the direction of orientation shows a layer or a film of a perpendicular liquid crystal (that is, it is substantially parallel to normal of film) substance substantially to a field of a film.

[0017]This invention relates to optical variable marking containing a translucent substrate which has the 1st surface covered by an optical variable layer, and the 2nd surface partially covered in a layer covered with a metal layer or metal of predetermined pattern shape.

[0018]A process at which the 2nd surface coats the 1st surface of a translucent substrate covered with metal with a layer of a cholesteric-liquid-crystal substance in which this invention can further polymerize, With a process of polymerizing a substance which made plane surface orientation arranging a cholesteric-liquid-crystal substance, and was arranged in the cholesteric phase, and a process of removing a field where a metal layer was chosen from the 2nd substrate face by laser, and forming a pattern, It is related with a method of preparing optical variable marking which is indicated to the above and the following.

[0019]The process at which the 2nd surface coats the 1st surface of the translucent substrate covered with metal with the layer of the optical variable paints currently distributed by the binding material in which this invention is still more transparent, And the field where the metal layer was chosen is removed by laser, and it is related with the method of preparing optical variable marking which is indicated to the above and the following according to the process of forming a pattern.

[0020]This invention relates to accessories including optical variable marking further.

[0021]This invention relates to a security article including optical variable marking further.

[0022]This invention relates to the decoration method which uses optical variable marking further.

[0023]. This invention includes further optical variable marking which is indicated to the above and the following. In particular, it is related with security marking for data or the forgery prevention of information, attestation, a check, or discernment, the thread (thread) or a device, a hologram, the hot Stamping foil (hot stamping foil), or a watermark.

[0024]This invention relates to the data storage medium or the precious document which includes further marking, thread (thread), a device, a hologram, the hot Stamping foil (hot stamping foil), or a watermark which is indicated above.

[0025]

[Mode for carrying out the invention]Optical variable marking by this invention coats with an optical variable layer the back side of the substrate preferably covered with the metal which does not reflect light, and is prepared as a multilayer film by removing metallurgical coating using after that, for example, laser, marking art. Although a substrate does not reflect light, since it does not absorb 100%, in the field by which laser marking was carried out, a substrate enables the penetration of the light which passes through a sample. It is the usual conditions,

namely, when it sees without a strong light source from behind a film, the color in which the optical variable layer was reflected is seen, but a design cannot be recognized. However, when a strong light source is placed back and seen, a design can be recognized visually in the place where light penetrated the substrate and the film. The light which reflected a transmitted light is a different color.

[0026]In the desirable embodiment of this invention, an optical variable layer contains a cholesteric-liquid-crystal (CLC) substance. The CLC substance in a cholesteric phase shows the molecular structure twisted to the spiral type. In the layer of the CLC substance macroscopically arranged by plane surface orientation, to the field of a layer, a screw axis carries out the interaction of the incident light to the structure twisted to the spiral type of the CLC substance, when perpendicular. As a result, a CLC layer shows 50% of alternative reflection of the incident light intensity of a specific wavelength as a light which has the polarization rotation nature of a cholesteric spiral and the same direction and by which circular light was carried out. 50% which remains, it penetrates as a light which has the polarization rotation nature for opposite and by which circular light was carried out. Therefore, when it is recognized [in / when it sees to the substrate or the black substrate which does not reflect light / the background that the reflected colors of a CLC substance are dark] visually clearly and sees by penetration to this. The CLC substance is transparent, is the basis to which the angle to see was changed, and can mainly see the reflective characteristic as a pattern of an interference color.

[0027]The reflective center wavelength λ is dependent on the pitch p and the average refractive index n of a CLC substance according to formula $\lambda = n \cdot p$.

[0028]The effective spiral pitch of the CLC layer which carries out an interaction to incident light, therefore the wavelength of a reflected light change depending on the angle to see. When it sees at the angle enlarged from the usual angle by this, the reflected light of a CLC layer is shifted to the short wavelength side. Preferably, a CLC substance reflects the light of the visible wavelength range. When a CLC substance can be chosen so that a large whole wavelength band or visible spectrum may be reflected again, and specific reflected colors see directly as a result, it does not see, but it may be recognized visually by observing through a circular light board. The CLC film or CLC coating, and those manufacture of the large zone are indicated to European patent EP0606940, international patent application public presentation WO97/35219, European patent EP0982605, and international patent application public presentation WO99/02340, for example.

[0029]In another desirable embodiment of this invention, an optical variable layer includes one or more the pearlescent pigments or interference paints which are distributed by the transparent binding material.

[0030]. Suitable paints are coated with a titanium dioxide, iron oxide, titanium oxide iron,

chromic oxide, or one or more layers of such combination, for example. For example, it is flakes containing the substrate of mica, SiO_2 , aluminum $_2\text{O}_3$, TiO_2 , or glass, or they are flakes including the combination of metal and a metal oxide. Desirable things are metal flakes of the aluminum currently coated with the layer of iron oxide and/or a silica dioxide, for example. For example, U.S. Pat. No. 5,364,557, U.S. Pat. No. 5,834,072, . As [indicate / to European patent EP0601483, international patent application public presentation WO94/22976, said WO97/27251, said WO97/27252, said WO97/30136, said WO99/02340, or said WO99/11719] It is also possible to use the mixture of the cholesteric-liquid-crystal paints containing the CLC substance which polymerized or constructed the bridge or a pearlescent pigment, and CLC paints. IRIOJIN (Iriodin) (registered trademark) by which especially the suitable thing is marketed, for example, The paints of KISHIRARIKKU (Xirallic) (registered trademark) or color stream (Colorstream) (registered trademark) (Merck KGaA ()) [Darmstadt and] Available from Germany, PARIO chromium (Paliochrome) (registered trademark) paints (BASF AG ()) [Ludwigshafen and] Available from Germany, flex time (Flex) (registered trademark) (Flex Inc. ()) [Santa Rosa and] They are pearlescent pigments, such as California, the U.S., or Helicon (Helicone) (registered trademark) cholesteric-liquid-crystal paints (available from Wacker-Chemie GmbH (Munche, Germany)).

[0031]In this field, the suitable binding material system which may be used with the above-mentioned paints, and the further additive are known, for example, are indicated to international patent application public presentation WO97/27251, said WO97/27252, and said WO99/11719.

[0032]A film, paper, a board, leather, cellulose sheets, textiles, a plastic, glass, Ceramics Sub-Division, and metal are contained in the suitable substrate used in optical variable marking by this invention. A suitable plastic is a polymer film of polyester, such as polyethylene terephthalate (PET), polyvinyl alcohol (PVA), polycarbonate (PC), Gia Sept Iles cellulose, or a bird acetyl cellulose (TAC), for example. For example, the PET film is marketed from ICI Corp. by the brand name of MERINEKUSU (Melinex). The translucent substrate is marketed from CPFilms.

[0033]A translucent substrate is the plastic film made dark, for example until absorption became 95% by, desirable for example, including optical absorption nature particles like carbon black.

[0034]Especially a desirable thing is the substrate of translucent paper or a plastic covered with the metal of aluminum.

[0035]Another desirable embodiment is related with using a circular light board (for example, circular light board film of a plastic) as a substrate. When covered with metal, this is visible as a black film, when it sees by reflection. A polarizing plate film makes more light penetrate in the field currently processed so that metallurgical coating may be removed.

[0036]The layer covered with a metal layer or metal can be chosen from an alloy like aluminum, Cu, nickel, Ag, Cr, Pt-Rh, or nickel-Cr, for example. The translucent substrate covered with metal can be used directly and easily from a commercial item.

[0037]A pattern is formed of laser marking for which the surface of metal of the translucent substrate used Nd-YAG laser, CO₂ laser, or an excimer laser after that and preferably.

Thereby, metal is removed from a substrate and a pattern remains on a substrate.

[0038]Although the surface of a substrate is preferably planate, it can also have structure, a pattern, and/or relief. The shape, the structure, the pattern, and/or relief of a substrate are preferably set by the application for which double reflex marking of this invention asks. Suitable structure art and patternizing art are fully especially known by the person skilled in the art in the field of precision engineering and micro technology, and each art of lithography, etching, cutting, a stamp, punching, emboss processing, molding, and electronic electrical discharge machining is included in such art.

[0039]When the CLC substance which can polymerize is used, [such a substance] It is a mixture of the meso genic compound which has preferably a basis in which one polymerization is possible, and the meso genic compound (compound 2 reactivity, many reactivity, bifunctional, or polyfunctional) which has a functional group in which two or more polymerizations are possible. By polymerizing such a mixture, it is free-standing and the network structure of the three-dimensional polymer which shows big mechanical stability and heat stability, and shows temperature dependence with low the physical property and optical property is acquired.

[0040]The desirable CLC mixture which can polymerize contains the meso genic compound which has a functional group in which one polymerization is possible and in which at least one polymerization is possible, and the meso genic compound which has a functional group in which two or more polymerizations are possible and in which at least one polymerization is possible.

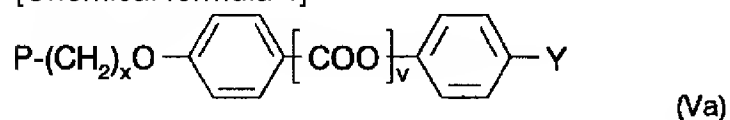
[0041][by changing the concentration of a polyfunctional meso genic compound or a non-meso genic compound] An important glass transition temperature, heat stability and mechanical stability, or solvent tolerance can be easily adjusted with the bridge construction density of a polymer film, and it also about the temperature dependence of the physical property and chemical nature, for example, the optical property of the film which polymerized.

[0042]The CLC substance which can polymerize can contain a meso genic compound in which one or more AKIRARU polymerizations are possible, and a meso genic compound in which one or more chiral polymerizations are possible. Or such a CLC substance can be added to a meso genic compound in which a chiral polymerization is possible, or can instead contain a chiral non-polymerizable [one or more] dopant.

[0043][an example of a suitable meso genic compound which may be used for a CLC

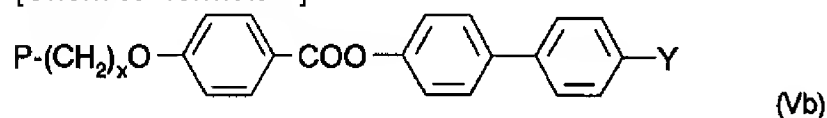
substance which can polymerize and which can be polymerized] For example, international patent application public presentation WO93 / 22397; European patent EP0,261,712; Germany patent DE 195, 04, and 224; it is indicated by international patent application public presentation WO95/22586, and said WO97/00600. However, a compound indicated by these documents shall not limit the range of this invention, but shall be regarded as a mere example. [0044] It never targets to understand only as illustration an example of a meso genic compound in which a useful chiral polymerization is possible, and an AKIRARU meso genic compound which can be polymerized, and to limit this invention especially, but is shown in the following table aiming at explaining this invention rather. : [0045]

[Chemical formula 1]



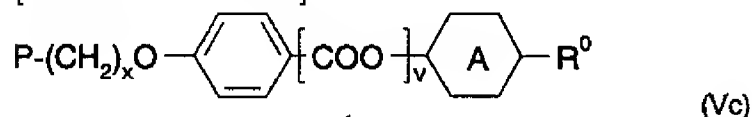
[0046]

[Chemical formula 2]



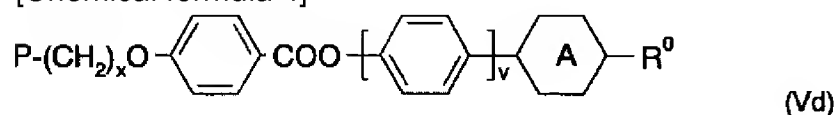
[0047]

[Chemical formula 3]



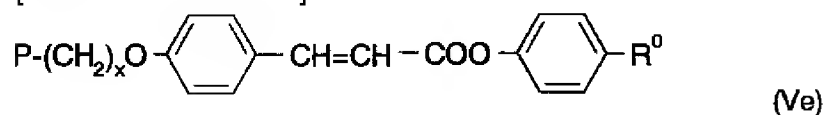
[0048]

[Chemical formula 4]



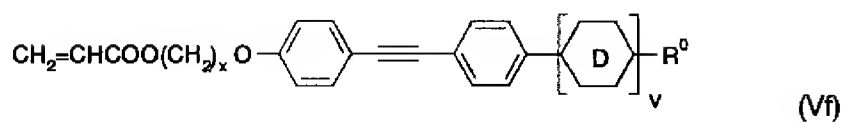
[0049]

[Chemical formula 5]



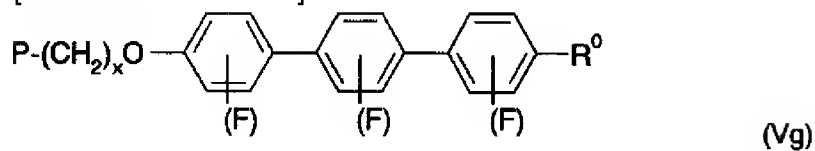
[0050]

[Chemical formula 6]



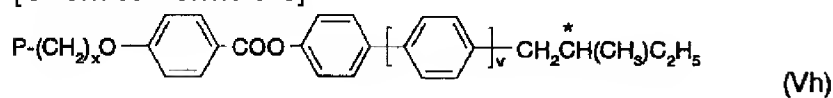
[0051]

[Chemical formula 7]



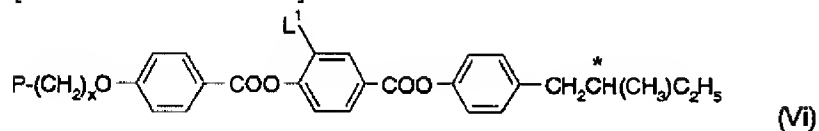
[0052]

[Chemical formula 8]



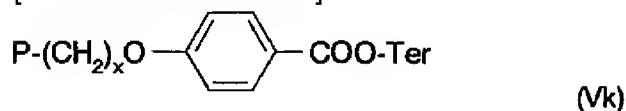
[0053]

[Chemical formula 9]



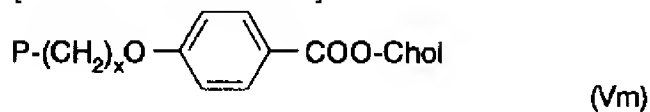
[0054]

[Chemical formula 10]



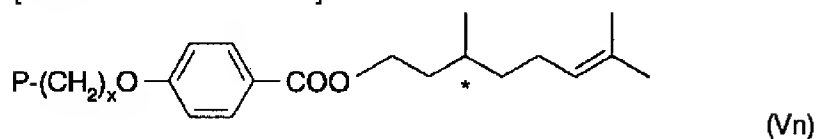
[0055]

[Chemical formula 11]



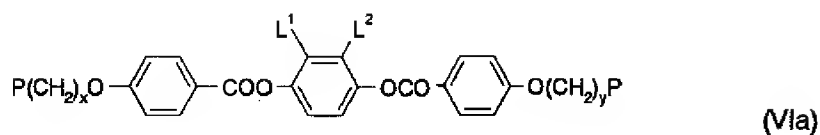
[0056]

[Chemical formula 12]



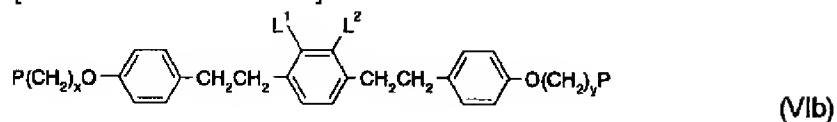
[0057]

[Chemical formula 13]



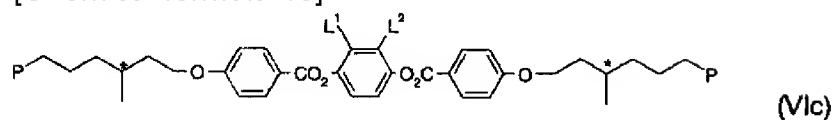
[0058]

[Chemical formula 14]



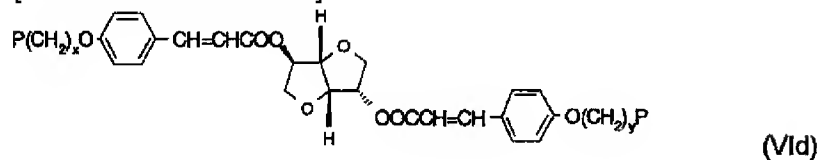
[0059]

[Chemical formula 15]



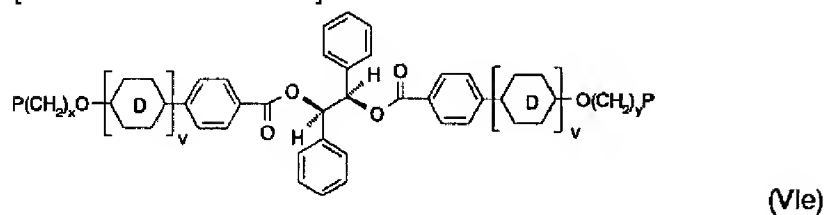
[0060]

[Chemical formula 16]



[0061]

[Chemical formula 17]



[0062] P has among a formula either of the desirable meaning indicated to the meaning of the formula I, and the above, x and y are the same integers or different integers from 1 to 12, and A and D are 1,4-phenylene or 1, and 4-SHIKUROHE xylene, v is 0 or 1, Y is a polar group, and R⁰ is the alkyl group or alkoxy group of non-polarity, and, [Ter] For example, are a terpenoid machine like menthyl, Chol is a cholesteryl group, and L¹ and L² become independent, respectively, They are H, F, Cl, OH, CN, NO₂ or an alkyl group that has one piece - seven C atoms by a case, an alkoxy group, an ARUKIRU carbonyl group, or an alkoxycarbonyl group.

[0063] In relation to this, the term "polar group" F, Cl, CN, NO₂, Have OH, OCH₃, OCN, SCN, and C atom up to four pieces, and it has the carbonyl group, the carboxyl group, or one piece -

four C atoms which are fluorinated by the case, The basis chosen from the alkyl group or alkoxy group by which oligo mono-fluorination and fluorination or poly fluorination is carried out is meant. The term "nonpolar group" means the alkyl group which has one or more C atoms (preferably one piece - 12 C atoms), or the alkoxy group which has two or more C atoms (preferably two pieces - 12 C atoms).

[0064]The CLC substance which can polymerize can be added to the meso genic compound in which a chiral polymerization is possible again, or can instead contain a chiral nonresponsiveness [one or more] dopant. The chiral dopant used typically is R811 or S811, R1011 or S1011, R2011, S2011, or CB15 of marketing (available from Merck KGaA (Darmstadt, Germany)), for example.

[0065]A very desirable dopant is a chiral dopant which has big spiral twist capability (HTP), The dopant containing a sorbitol group which is especially indicated to international patent application public presentation WO98/00428, The dopant containing a hydronalium benzoin machine which is indicated to British patent GB2,328,207, A chiral binaphthyl derivative which is indicated to European patent EP01111954.2, A chiral BINAFOU toll acetal derivative which is indicated to European patent EP01104842.8, A chiral TADDOL derivative which is indicated to international patent application public presentation WO02/06265, And it is a chiral dopant which has a chiral group of at least one fluorination joint machine which is indicated to international patent application public presentation WO02/06196, and said WO02/06195, end, or a center.

[0066]In the state where orientation was carried out macroscopically preferably, a CLC substance is polymerized on that spot (insitu). For this purpose, a translucent substrate is preferably coated with this substance directly. The coated substance is arranged by the plane surface orientation in which the liquid crystal element is carrying out orientation so that substantially in parallel [the direction of orientation of a liquid crystal] to a substrate. Then, a bridge is polymerized or constructed over these molecules, and the uniform orientation of a liquid crystal element is fixed. Arrangement and hardening are performed in the liquid crystal phase or middle phase of a substance. In this field, such art is known, for example, is generally indicated to Angew.Makromol.Chem.183 (1990), and 45-66 besides D.J.Broer. Or a CLC layer is removed after that and a CLC layer can be prepared on the auxiliary substrate laminated by the translucent substrate.

[0067][the arrangement of a CLC substance] [by for example, processing the substrate coated with a substance] By shear-straining a substance after that in the middle of coating, it may be attained adding to the substance which had the magnetic field or the electric field coated, or by adding a surface activity compound to the substance which can polymerize. the total theory of arrangement art -- for example, I.Sage -- "Thermotropic Liquid Crystals" (editor: -- G.W. --) [Gray and] With John Wiley& Sons, 1987 or 75 pages - 77 pages, T.Uchida, and

H.Seki, It is shown in "Liquid Crystals-Applications and Uses and the 3rd volume" (editor: B.Bahadur, World Scientific Publishing, Singapore, 1992 or 1 page - 63 pages). The total theory of an arrangement substance and arrangement art is shown by J.Cognard, Mol.Cryst.Liq.Cryst.78 (enlargement 1) (1981), and 1 page - 77 pages.

[0068]The polymerization of a CLC substance is produced by exposing a CLC substance to heat or chemicals radiation. Chemicals radiation means the radiation accompanied by high energy particles, such as radiation accompanied by the radiation, the X-rays, or the gamma ray accompanied by UV light, IR light, or light like visible light, ion, or an electron. Preferably, a polymerization is performed by UV irradiation in the wavelength which is not absorbed. As a source of supply of chemicals radiation, the aggregate of one UV lamp or a UV lamp can be used, for example. Cure time can be shortened when a big lamp output is used. Another possible source of supply of chemicals radiation is UV laser, IR laser, or laser like visible laser, for example.

[0069]A polymerization is performed under existence of the initiator which absorbs the wavelength of chemicals radiation. For example, when making it polymerize by UV light, it can decompose under UV irradiation and the photoinitiator which generates the free radical or ion which makes a polymerization reaction start can be used. In stiffening MESOGEN which has an acrylate group or a methacrylate machine and which can be polymerized, A radical photoinitiator is used, and when stiffening MESOGEN which has a vinyl group, an epoxide machine, and an oxetane machine and which can be polymerized, a cationic photoinitiator is used preferably. It is also possible to decompose, when it heats, and to use the polymerization initiator which generates the free radical or ion which makes a polymerization reaction start. As a photoinitiator for radical polymerizations, commercial IRGACURE (Irgacure) 651, IRGACURE 184, DAROKYUA(Darocure)1173, or DAROKYUA 4205 (altogether available from Ciba Geigy AG) can be used, for example, On the other hand, in the case of cation photo polymerization, UVI6974 (Union Carbide) of marketing can be used.

[0070]The CLC substance which can polymerize, for example A catalyst, a sensitizer, a stabilizing agent, inhibitor, Other one or more suitable ingredients, such as a chain transfer agent, a ***** monomer, a surface activity compound, lubricant, a wetting agent, a dispersing agent, a canal-ized agent, adhesives, a fluid improvement agent, an antifoaming agent, a deaeration agent, a diluent, reactive diluent, an adjuvant, colorant, a pigment, or paints, can be included further.

[0071]The CLC substance may contain further one or more monomers which can form a polymer linkage agent or a polymer linkage agent, and/or one or more distributed adjuvants. A suitable binding material and distributed adjuvant are indicated by international patent application public presentation WO96/02597, for example.

[0072]Especially a desirable thing is a liquid crystal substance which does not contain a

binding material or a distributed adjuvant.

[0073] In another desirable embodiment, a CLC substance contains the additive agent which guides or reinforces the plane arrangement of the liquid crystal substance on a substrate. Preferably, an additive agent contains one or more surface-active agents. The suitable surface-active agent is indicated by J.Cognard, Mol.Cryst.Liq.Cryst.78 (enlargement 1), and 1-77 (1981), for example. Especially a desirable thing is a nonionic surface-active agent, and for example, Fluorad which is the fluorocarbon surface-active agent marketed. (Fluorad) It is the surface-active agent of fluorocarbon like FC-171 (registered trademark) (available from 3M Co.), or Zonyl (Zonyl) FSN (registered trademark) (available from DuPont) itself.

[0074] The suitable additive agent is indicated by international patent application public presentation WO00/47694, for example. As for the indication, the whole is incorporated into this Description as reference.

[0075] Especially addition of a stabilizing agent is preferred in order to, prevent the spontaneous polymerization which is not desirable as for the polymerization nature substance at the time of storage for example. Theoretically as a stabilizing agent, all the compounds known by the person skilled in the art for this purpose can be used. These compounds are marketed broadly. 4-ethoxy phenol or butylated hydroxytoluene (BHT) is mentioned as a typical example about a stabilizing agent.

[0076] Other additive agents (for example, an additive agent like a chain transfer agent) can be added to the CLC substance which can polymerize, in order to change the physical property of the polymer film obtained. a chain transfer agent (for example, mono-functionality thiol compounds like a dodecane thiol.) Or when [for example,] polyfunctional thiol compounds like a bird methyl propane bird (3-mel KAPUTOPUROPIONATO), etc. are added by the polymerization nature substance, The length of the free polymer chain in the polymer film of this invention and/or the length of the polymer chain between two bridge construction are controllable. If the quantity of a chain transfer agent is increased, the length of the polymer chain in the polymer film obtained will become short.

[0077] [instead of the meso genic compound which can polymerize / bifunctional or polyfunctional / for increasing bridge construction of polymer] Or in order to increase bridge construction of polymer in addition to such a compound, it is also possible to add the non-meso genic compound which has a functional group in which two or more polymerizations are possible to 20% to the CLC substance which can polymerize. ARUKIRU diacrylate or ARUKIRU dimethacrylate in which C atom has an alkyl group which are one piece - 20 pieces as a typical example of a bifunctional non-meso genic monomer is mentioned. As a typical example of the non-meso genic monomer which has a basis in which three or more polymerizations are possible, bird methyl propane trimethacrylate or pentaerythritol tetraacrylate is mentioned.

[0078]In another desirable embodiment, the mixture of a polymerization nature substance contains the non-meso genic compound which has a functional group in which one polymerization is possible to 70%, and contains it 3% - 50% preferably. Alkyl acrylate or ARUKIRU methacrylate is mentioned as a typical example of the non-meso genic monomer of mono-functionality.

[0079]In order to fit the optical property of the polymer film obtained, it is also possible to, add the non-polymerizable liquid crystal compound of the quantity to 20 mass % for example.

[0080][optical variable marking by this invention] [for the use in security marking or the security thread (thread) for attestation of a subject like a data storage medium or a precious document, a check, or forgery prevention] And it is suitable especially in order to identify the hidden image in such a subject, information, or a pattern. Optical variable marking by this invention is directly applicable to said subject for a check or forgery prevention. [or optical variable marking by this invention] For example, it is applicable to subjects which are attached to a subject with the form of the information presentation layer, the hologram, the watermark, the emboss processing, pattern or design by which model aggressiveness was carried out, or others, and include the data, **s, and/or information, such as a data storage medium or a precious document. Optical variable marking is applicable to said a part of subject or one field which can apply to said subject so that the further data and/or information may be covered partially or completely, or does not include the further data and/or information.

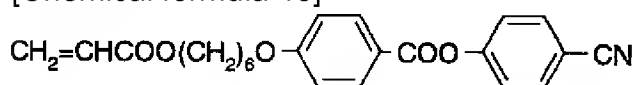
[0081]Optical variable marking by this invention The product for consumers, or household articles, It can apply to the body, foil, a packaging material, clothing, or textiles, or a plastic can be mixed, Or a bill, a credit card or an ID card, national ID document, It is applicable as security marking or the security thread (thread) to a precious document like the arbitrary products (a stamp, a ticket, a stock certificate, a check, etc.) which have a permit or a monetary value.

[0082]Since the operations differ when it sees by a penetration and reflection, [optical variable marking by this invention] It can set to a subject and a product which are indicated especially about visible light to the above which is a light transmittance state, is suitable especially for the above-mentioned purpose in the field or portion of a light transmittance state of the aforementioned subject or a product, and is preferably used for such a purpose.

[0083]

[Working example]: which prepares the CLC mixture which can polymerize the work-example 1 following -- compound (A) 32.60% compound (B) 3.00% compound (C) 30.16% compound (D) 29.56% compound (E) 3.59% IRGACURE (Irgacure) 651 1.08% [0084]

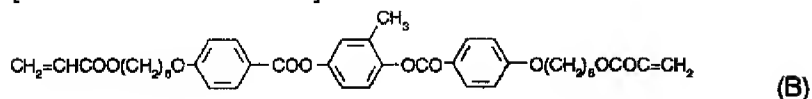
[Chemical formula 18]



(A)

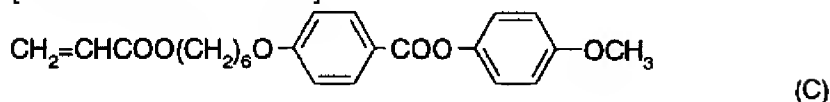
[0085]

[Chemical formula 19]



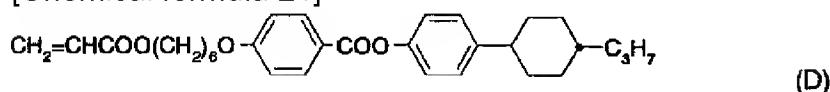
[0086]

[Chemical formula 20]



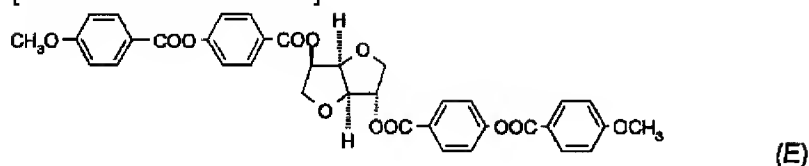
[0087]

[Chemical formula 21]



[0088]

[Chemical formula 22]



[0089]The meso genic compound (A), (B), and (C) which can polymerize can be prepared like such a method in accordance with the method indicated to Makromol.Chem.190, and 3201-3215 besides D.J.Broer (1989). The meso genic compound (D) which can polymerize, and its manufacture are indicated to British patent GB2,280,445. A chiral dopant (E) and its manufacture are indicated to international patent application public presentation WO98/00428. IRGACURE 651 is a commercial photoinitiator (Ciba Geigy).

[0090]The PET side of the PET film covered with metal is coated with a mixture, and it is made to polymerize by irradiating with UV light. Preferably, PET is made dark until an absorbance will be 95%. Then, the coated structure is exposed to a laser beam (Nd-YAG laser, 1064 nm, 100W) through coating, and coating of aluminum is removed from a film only at the place exposed to the laser beam. Coating does not change.

[0091]When it sees on condition of usual (i.e., when it sees without using a light source strong against the back of a film), reflected colors are seen and a design cannot be identified. However, when a strong light source is placed back and seen, a design can be recognized visually in the place where light penetrated the substrate and the film. The transmitted light is a

color from which a reflected light differs.

[0092]

[Effect of the Invention]When it is visible as a uniform layer which shows the reflected colors which change with the angles which an optical variable layer looks at when optical variable marking concerning this invention is seen by a reflected light and sees by the transmitted light, the pattern in a metal layer can be seen through an optical variable layer and a translucent board.

[Translation done.]